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Conference Abstract

The Value of Utilizing the Complete Temporal Distribution of Phenological Data

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Abstract

Numerous studies over the past decades have shown that species phenologies are shifting. Behind the large-scale patterns of shifting phenologies lies, however, large variability across species and space in terms of both the sign of the shifts (advance or delay) and their magnitude (rate of change). The shifts in the timing of seasonal events are usually studied by measuring change in one part of the phenological distribution over the season, such as the mean or first appearance of the event. This, however, gives us a mere glimpse of how (part of) a population is changing, thus limiting our ability to understand the underlying mechanisms. We demonstrate the benefits of taking a holistic approach to describing phenological change by considering shifts in the complete phenological distribution and interrelationships within it. As a case study, we make use of a database on bird chick banding events to understand the shifts in breeding phenology for 74 bird species across 43 years and 4 bioclimatic zones distributed across Finland. We find that bird breeding is stacking up towards earlier and more compressed peak periods. The majority of change can be attributed to a faster advance of the tail of the distribution, alongside minor advancement of the beginning of the season. We conclude that the observed shifts potentially intensify intraspecific competition by increasing the temporal co-occurrence of broods across large geographical areas. Nevertheless, these patterns would

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likely have not been recognized through summarizing the data by species mean dates alone. We therefore urge scientists and data managers to compile and utilize phenological data at higher resolution, retaining the original detail. This will allow us to capture multiple modes of population-level change, thereby providing deeper insights into how species are responding to ongoing climate warming.

Keywords

phenology curve, environmental change, nonanalogue shifts, phenological data, temporal distribution

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Conflicts of interest

We declare no conflicts of interest.